

REMARKS

Summary of the Office Action

Claims 1-3 are rejected under 35 U.S.C. § 102(b) as being anticipated by de Vrijer (U.S. Pat. No. 4,594,529).

Claims 4-8 are rejected under 35 U.S.C. § 103(a) as being unpatentable over de Vrijer.

Claims 9-16 are objected to.

Claims 17-20 are allowed.

Summary of the Response to the Office Action

Applicants thank the Examiner for indicating that claims 9-16 contain allowable subject matter, and for allowing claims 17-20.

Applicants have amended claims 1, 8 and 17.

Claims 1-20 are pending.

All Claims Define Allowable Subject Matter

Claims 1-3 are rejected under 35 U.S.C. § 102(b) as being anticipated by de Vrijer.
Claims 4-8 are rejected under 35 U.S.C. § 103(a) as being unpatentable over de Vrijer. To the extent the Examiner considers the rejections to apply to the newly amended claims, they are traversed as being based on a reference that neither teaches nor suggests the novel and unobvious combination of features recited in the amended claims.

Claims 1-8 now include the features of an arc tube having a discharge space including substantially no mercury. As described in the Background of the Invention in the Applicants' specification at page 2, line 20 - page 3, line 2, related metal halide lamps require both inert

gases (starter gases) to start discharge, and mercury. In order to create high pressure within the tube and to increase tube wall temperature. A starter gas is used for starting discharge. The temperature of the walls of the arc tube gradually rises at the start of discharge. In a comparatively short time, the vapor pressure of the mercury rises as the tube wall temperature exceeds 300°C, and a high temperature arc (hot plasma) is generated. The tube wall temperature then rapidly rises and the metal halide vaporizes. As described in the Summary of the Invention in the Applicants' specification at page 4, ll. 7-8, the invention is directed to a metal halide lamp where no substantial amount of mercury is enclosed. As described at page 7, ll. 7-10, a sufficiently high arc tube operating temperature can be obtained, without employing the traditional amounts of mercury, by configuring the arc tube so as to promote temperature rise of the arc tube, and by enclosing a rare gas at a higher pressure than in the related art for use as a starter gas.

Applicants respectfully submit that de Vrijer does not teach or suggest the above recited features. Moreover, de Vrijer explicitly teaches away from an arc tube having a discharge space including substantially no mercury. As described at col. 1, lines 37-40 of de Vrijer, the invention provides a gas discharge lamp wherein the gas filling comprises rare gas, mercury, and a metal halide. As described in col. 1, line 67- col. 2, line 5, the properties of the discharge arc are obtained by all of the measures by which the lamp according to the invention is distinguished from known lamps. With quantities of mercury larger than the defined quantity, the discharge arc is curved, whereas with smaller quantities the efficiency of the lamp is unacceptably low.

Because de Vrijer fails to disclose at least the above noted features of Applicants' independent claims, it is respectfully submitted that de Vrijer can neither anticipate nor provide a prima facie showing of obviousness with regard to Applicants' independent claims.

In addition, there would have been no motivation to modify de Vrijer as suggested in the Office Action because, similar to the related art disclosed in Applicants' specification, de Vrijer requires a substantial amount of mercury to operate. Moreover, de Vrijer would be made inoperable if substantially all of the mercury were removed.

At least for the above described reasons, Applicants respectfully request that the rejection of claims 1-3 under 35 U.S.C. § 102(b), and claims 4-8 under 35 U.S.C. § 103(a) be withdrawn. Applicants respectfully submit that all pending claims are in condition for allowance for reasons described in the Office Action, as well as reasons described above.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached pages are captioned "Version with markings to show changes made."

CONCLUSION

In view of the foregoing, Applicants respectfully request reconsideration and the timely allowance of the pending claims. Should the Examiner feel that there are any issues outstanding after consideration of this response, the Examiner is invited to contact Applicants' undersigned representative to expedite prosecution.


If there are any other fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-0310. If a fee is required for an extension of time under 37 C.F.R. § 1.136 not accounted for above, such an extension is requested and the fee should also be charged to our Deposit Account.

Respectfully submitted,

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By:


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VERSION WITH MARKINGS TO SHOW CHANGES MADE

Claims 1, 8 and 17 have been amended as follows:

1. (Amended) A discharge lamp, comprising:

an arc tube having a discharge space **including substantially no mercury;**

a pair of electrodes facing each other in the discharge space; and

a low melting point metal halide with a melting point less than or equal to approximately 400°C and a rare gas enclosed at high pressure in the discharge space in such a manner as to create a hot plasma at a high temperature and pressure, promote an increase in tube wall temperature, and vaporize the metal halide to emit light.

8. (Amended) A metal halide lamp, comprising:

an arc tube having a discharge space including **substantially** no mercury;

a pair of electrodes projecting in such a manner as to face each other in the discharge space within the arc tube, a substantially cylindrical arc capable of being generated between ends of the pair of electrodes;

a buffer gas serving as a starter gas and including xenon at a pressure of between approximately 7 to 20 atms at room temperature located in the discharge space;

one of sodium halide, scandium halide, and a compound of sodium halide and scandium halide located in the discharge space; and

a low melting point metal halide with a melting point less than or equal to approximately 400°C located in the discharge space.

17. (Amended) A metal halide lamp, comprising:

an arc tube having a discharge chamber including substantially no mercury;

a pair of electrodes projecting in such a manner as to face each other in the discharge space within the arc tube, with a substantially cylindrical arc capable of being generated between ends of the pair of electrodes;

a buffer gas serving as a starter gas located in the discharge space and including xenon at a pressure of approximately 7 to 20 atms at room temperature;

one of sodium halide, scandium halide and a compound of sodium halide and scandium halide located in the discharge space; and

a low melting point metal halide with a melting point less than or equal to approximately 400°C located in the discharge space, wherein

an internal diameter of the arc tube is within a range of approximately 0.6 mm to 1.7 mm larger than a diameter of the arc between the ends of the electrodes, and the electrodes protrude into the discharge space a length of approximately 1.0 mm to 1.7 mm, a mole content ratio of sodium halide to scandium halide is approximately 1.0 to 15, and a mole content ratio of the low melting point metal halide to the scandium halide is in a range of approximately 0.5 to 3.0.